

Na layer response to geomagnetic activities: statistical analysis based on Odin/OSIRIS data

T. T. Tsuda¹, T. Nakamura², M. K. Ejiri², T. Nishiyama², K. Hosokawa¹, T. Takahashi², J. Gumbel³, and J. Hedin³

¹*The University of Electro-Communications*

²*National Institute of Polar Research*

³*Stockholm University*

The Na layer is normally distributed from 80 to 110 km, and the height range is corresponding to the ionospheric D and E region. In the polar region, the energetic particles precipitating from the magnetosphere can often penetrate into the E region and even into the D region. Thus, the influence of the energetic particles to the Na layer is one of interests in the aspect of the atmospheric composition change accompanied with the auroral activity.

There are several previous studies in this issue. For example, recently, we have reported an initial result on a clear relationship between the electron density increase (due to the energetic particles) and the Na density decrease from observational data sets obtained by Na lidar, EISCAT VHF radar, and optical instruments at Tromsø, Norway on 24-25 January 2012. However, all of the previous studies had been carried out based on case studies by ground-based lidar observations.

In this study, we have performed, for the first time, statistical analysis using Na density data from 2004 to 2009 obtained with the Optical Spectrograph and InfraRed Imager System (OSIRIS) onboard Odin satellite. In the analysis, we have categorized the Na density data according to the AE index, which is a geomagnetic index indicating the auroral activity in the polar region. Then we have compared those to investigate relationship between the Na density and geomagnetic activities, and its height-latitude characteristics. As the result, we have found significant decrease in the Na density above ~95 km height in the both polar regions, i.e., the Southern and the Northern polar regions. The result would be fairly consistent with our previous report. In the presentation, we will show these results and discuss the Na layer response to the energetic particles.